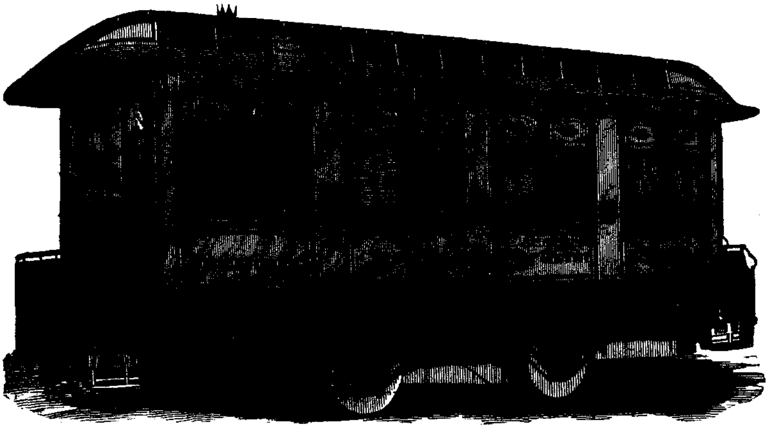
STEAM ON STREET RAILWAYS.

II.

Extract from the Secretary's Report, at the Meeting of the Franklin Institute, May 16th, 1877.

In furtherance of the proposition to lay before you such information as is available regarding the progress making toward the general introduction of mechanical propulsion on street railways, you are here presented with illustrations on the screen, of the steam street car invented by Mr. Louis Ransom and built by Messrs. Gilbert, Bush & Co., of Troy, N.Y. Six of these cars (Fig. 1) were placed on the Market Street line in this city on March 21st, 1877, and have run with considerable regularity to this time, over what is known as the Baring Street branch, which has maximum grades of about four and one-half per cent., and many curves.

Fig. 1.



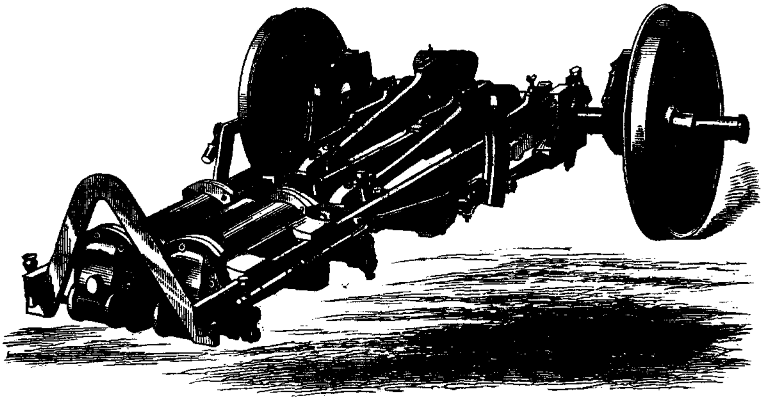
These cars are 16 feet long in the clear inside, and have a seating capacity for 20 persons, but are very frequently loaded with 50 persons.

They have a wheel base of 7 feet, rather more than the ordinary horse-car, by which it is claimed there is less *teter* in passing over rough or uneven places in the track, although it increases the friction in passing curves.

The boiler is upright, with shell 37″ diam. by 56″ high, made of one sheet of No. 1 charcoal hammered iron, and contains 300 upright tubes 1¼″ diam. and 12″ long, and has 116 square feet of heating surface and 6½ square feet of grate. The boiler is tested to 200 lbs. pressure per square inch, and its working pressure is 120 lbs. The steam room in the boiler is 26 times the capacity of one engine cylinder.

The engine (Fig. 2) is a double one, having steam cylinder 5¼″ diam. and 14″ stroke. The two cylinders are cast in one piece, and have attached to them three bars which extend to, and are connected by journal boxes to, the crank axle, thus forming the framing of the engine. By this arrangement all the working strain of the machinery is brought on these bars or frame, and not on the frame of the car body. The slide valves are operated by a link motion and two eccentrics to each cylinder. The link is not raised or lowered as in the more general practice, but oscillates on a pin at one edge and midway of its length of the link. The valve rod is attached to a pin in the link block, which is moved up or down to reverse the engine or vary the rate of expansion. The reversing lever is placed in the corner of the car in front of, and convenient to, the engineer's right hand. One end of the engine is supported by the crank axle, which is placed at the after end, and the forward or cylinder end of the engine is supported by a bale passing over a strong bar attached to the bottom of the car body. The usual straight axle supports the forward end of the car, but its wheels are not coupled to the driving wheels. The whole propelling apparatus, being supported at three points, is not easily racked or injured by derailment, gives great flexibility and is easily removed in case of extensive repairs; when

Fig. 2.



slight repairs are needed the car can be run over a pit, the front end of the engine detached and allowed to hang down from the crank axle like a pendulum. The machine is also accessible for cleaning, oiling, packing, etc., through trap-doors in the floor of the car.

There is attached a steam brake with a cylinder 3½ inches diameter and 8 inch stroke. The piston rod is extended into a rack which works in a geared sector. From pins in the sector, connection is made by links to knuckle-jointed levers, forcing the brake shoes against the inner edges of the wheels. The lever of the brake throttle is so arranged with reference to the engine throttle lever, that the act of shutting off steam from the engine, opens the brake throttle, thus enabling the engineer to perform both these acts with one short stroke of the hand. The boiler is placed a little forward of the front axle and the water tank under the floor at the rear end. The space for passengers is about equally divided forward and aft of the hind axle, so that their weight nearly all comes on the driving wheels. The noise of the exhaust is quieted by passing the steam through a muffler consisting of a box of considerable size filled with balls or pebbles.

Mr Ransom differs from the view expressed at the last meeting of the Institute, regarding the use of the crank axle, and holds that all the English, and many American Locomotives are still built with inside connections; that they impart a much steadier motion than outside connections; that the crank axles do not prove essentially weaker than the straight ones; that outside connections cause a vibrating motion to the car at high speed, and have no advantage except ease of access to the working parts.

He places great stress upon the injury done to the machinery of all steam street cars, from its exposure to the dust of paved streets, and estimates the cost of repairs from this cause alone (if not guarded against), as a large percentage of the entire cost of operating such cars. To overcome this he has enclosed the machinery in a box or casing so perfectly dust-tight, that after running all day through the dusty streets, the engine is not only free from dust, but covered with drops of water, condensed from the slight escape of steam from the stuffing boxes. The facility with which the machinery can be so enclosed, to protect it from dust, he claims as another advantage in the use of the crank axle for street cars.

These engines can be applied to old car bodies, as it is only necessary to raise the rear end of the car so as to run out the axle, and put the engine crank shaft in its place, and attach the front end of the engine to the bottom of the car; provision would of course have to be made for the boiler.

In January, 1876, one of the Ransom steam cars was put on the Coney Island Railroad, extending from city line to Gravesend, a distance of 4½ miles, where it run 81 miles per day for 5 months. The round trip of 9 miles was run in 40 minutes, and then the car stood 50 minutes. The consumption of coal was 600 lbs. per day, or 7·4 lbs. per mile. This car was submitted to severe trials before and after its regular work at Coney Island, and was afterwards sold to, and is now running on, the Onondaga Valley Road, in Syracuse, N. Y.

The question of consumption of coal by the cars now running on the Market Street line, has not yet been determined satisfactorily, but Mr. Ransom hopes that it will be less than that mentioned above. The entire cost of running 81 miles per day, is, however, estimated at $8.31 per day.

Some difficulties have been encountered in running the present cars on the Market Street road, which the inventor says arose principally from two causes. First, he expected to have them run on the main line, and did not know of the many curves and steep grades of the Baring Street branch, over which these are running, and the 5¼ inch cylinders proved to be too small; they should have been 7 inches diameter, and the builders are now making them of that size for such service. Second, the peculiar, greasy mud of such a city as this, causes the ordinary chilled, cast-iron wheels to slip, and to overcome this, he purposes hereafter to use steel tires on the driving wheels.

When these and some minor changes are made, the inventor is very confident that his steam cars can be operated at a cost greatly below that of horse cars.

French Railway System.—In a memoir of M. de Franqueville, M. F. Jacqmin reviews the relations between the railways and the State, in different countries, coming to the conclusion that France alone has solved the difficult problem of reconciling these two grand principles: authority and liberty. The whole territory of France is divided into six grand railway-departments, in each of which, with a few unimportant exceptions, all the railways have been conceded to a single company.